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Buffalo Bayou Bonanza

By the year 1907, Galveston had outstripped her chief Gulf Coast rival, New Orleans, ranking second among all U.S. ports in the value of foreign exports. Exporting goods valued at $220,504,917 in 1911, the island port remained second only to New York. Cotton held fast as its predominant article of export.[1]

But commercial dynamics along the Texas Coast were slated for drastic change and much of the groundwork for the metamorphasis had already been laid. As Galveston reveled in port prosperity, other Texas harbors were struggling to acquire deep water and gain ascendency. The new port of Texas City had been established with relative speed. A 16-foot-deep channel from deep water in Galveston Harbor across Galveston Bay to Texas City first had been dredged by the Texas City Terminal Company during 1895-96. Taken over by the army engineers in 1899, the 7-mile-long channel was deepened to 25 feet by 1905; another ten years would see adoption of a 30-foot project. The Sabine-Neches Waterway was well underway and, further down the coast, other channels were being improved by the Galveston engineers. Fifty miles inland from Galveston, interests along Buffalo Bayou were pursuing their particular goal with dogged persistence.

A Pioneer Vision

The goal of a ship channel extending from the Gulf to the head of navigation on Buffalo Bayou predates the inception of the city of Houston in 1836 and the boisterous era of the Texas Republic. Although early colonization had proceeded slowly along the banks of Buffalo Bayou, the stream's potential as a navigational outlet for produce of the rich Brazos agricultural region was quickly recognized. Running in an east-west direction, the bayou afforded a wide and deep stretch from its junction with the San Jacinto River to Brays Bayou, where the city of Harrisburg was established in 1826. Although its course became more narrow and tortuous between Brays Bayou and White Oak Bayou, Buffalo Bayou remained deep along this western extremity. Beyond the bayou's eastern extremity

Opposite page: From Long Reach turning basin, Houston Ship Channel winds its way toward the waters of Galveston Bay.

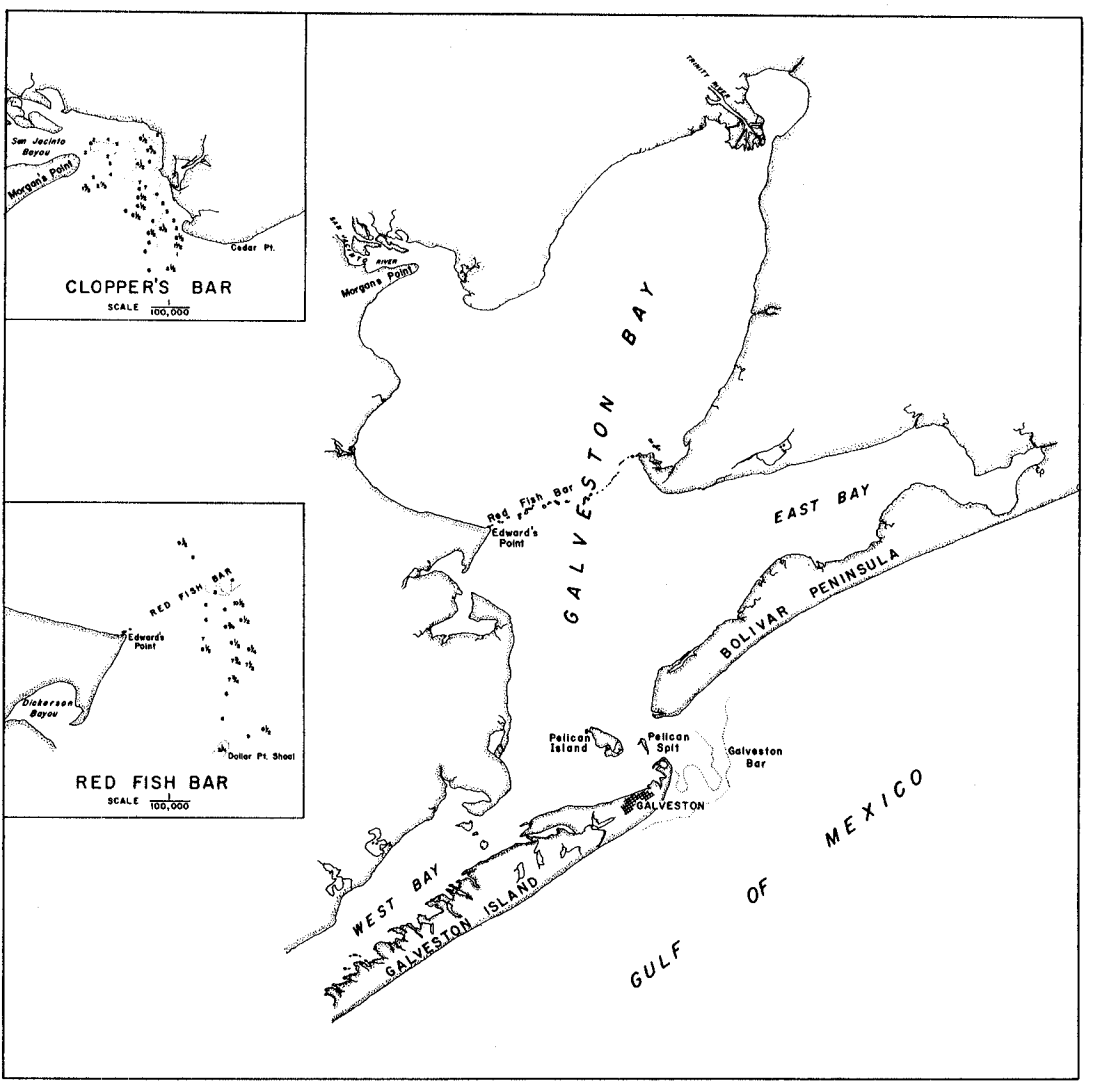
lay a direct path to the sea through the San Jacinto River, past Morgans Point, across the waters of Galveston Bay, and through Bolivar Roads and Galveston Channel.

Assorted impediments to navigation lay along the route that would grow into the Houston Ship Channel of the twentieth century. After crossing the 12-foot bar at the entrance to Galveston Channel, a vessel would next confront a shell reef, known as Red Fish Bar, which stretched across the middle of Galveston Bay. Running aground on this reef was an almost predictable occurrence in the course of a trip to Buffalo Bayou. Ship captains, at the mercy of the winds and tides, were resigned to waiting for the water level to rise before they could cross the bar and move on. The second obstruction of this type was Clopper's Bar, just opposite Morgans Point where the waters of the San Jacinto River entered Galveston Bay. Beyond this point, the meandering stream accommodated light-draft vessels fairly well as far as Harrisburg. The reach above Harrisburg required, at the least, removal of snags and logs to make its winding course navigable.

An ordinance passed by the Houston City Council on June 10, 1841, established the Port of Houston with authority over all wharves, landings, slips, and roads on the banks of Buffalo and White Oak bayous within the city limits. This provided not only the first semblance of order along the waterfront, but also for collection of wharfage fees that could be applied to waterfront and bayou improvement. Early the next year, the Texas Republic empowered the city of Houston to clear away wrecked steamers and to insure future navigability above Harrisburg by levying a tonnage tax on vessels entering Houston.[2]

By the early 1850s, wharfage revenue had enabled the city to clear the upper bayou of the troublesome snags and overhanging limbs, but in their place emerged a new hazard to navigation. Heavy rains washed mud from the city streets and from cuts in the embankments into the bayou, causing shoaling that necessitated acquisition of a dredge by the city around 1852. During this decade, the Houston Navigation Company (organized in 1851 as the Houston and Galveston Navigation Company) dominated navigation on the bayou. This company operated regular steamship service between Houston and Galveston, exercising a virtual monopoly on shipping.[3]

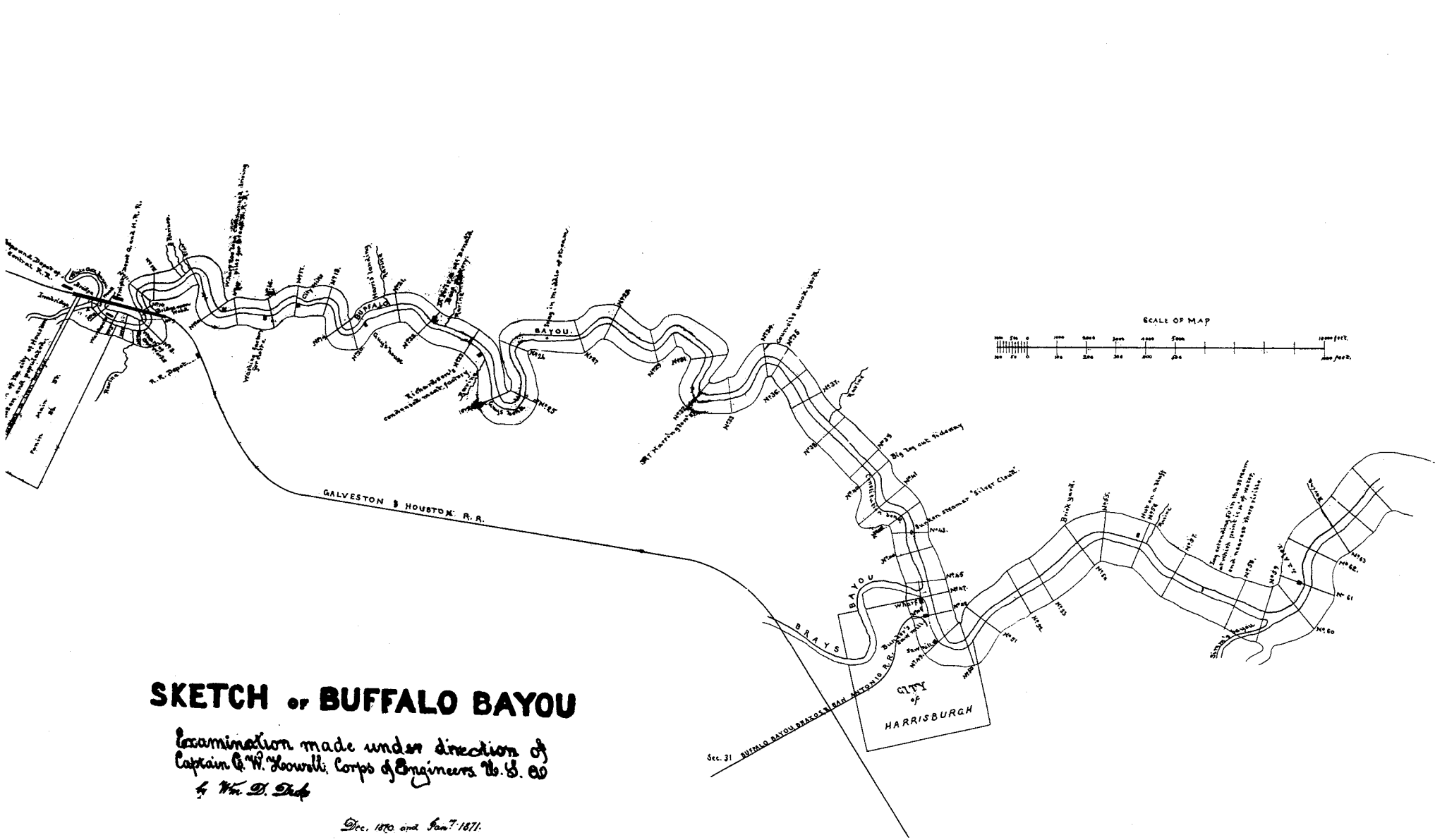
Efforts began to improve the obstructions further down the channel. Formerly, the states rather than the national government bore the burden of improving rivers, canals, and roads within their boundaries. Establishing a firmer financial footing, the new state of Texas was able to shoulder some responsibility for its streams. On February 7, 1853, the state legislature allocated $4,000 each to Buffalo Bayou and the San



Obstructions in Galveston Bay (Traced from U.S. Coast Survey map dated 1851)

Jacinto River. In April, 1857, the state engineer awarded a $22,725 contract for improving Clopper's Bar. Later followed a $23,000 contract for improvement of Red Fish Bar.[4]

Of particular significance to bayou development was Houston's emergence, during the 1850s, as the railroad center of Texas. Houston was clearly victorious in its contest with Galveston for the land routes; however, when Galveston finally succeeded in obtaining its own railroad late in 1859, goods could be transported more cheaply between the two cities by rail than by bayou. Fighting to keep commerce on the bayou, Houston held a special election in May, 1860 and voters repealed the wharfage fees, no longer essential for bayou improvement.[5]



SKETCH of BUFFALO BAYOU

Examination made under direction of
Captain C. W. Howell, Corps of Engineers U. S. A
by Wm. D. Dick

Dec. 1870 and Jan.y 1871.

Activity on the bayou nevertheless suffered from the Union blockade of Confederate ports imposed on the Texas Coast in the summer of 1861, limiting navigation mainly to enemy ships and blockade runners. In contrast, the Galveston Wharf Company thrived during the war and the period of Reconstruction that followed.

> Secure in the control of the best harbor in the state, the [Galveston] wharf company exacted all the profit its monopoly permitted, thus playing a leading role in driving Houston to seek deep water.[6]

Disenchanted with excessive charges at Galveston, Houstonians were more determined than ever to bypass the island port. The Houston Direct Navigation Company, chartered on October 9, 1866, devised the practice of loading and unloading ocean vessels in mid-channel and transporting the cargoes up and down the bayou on barges. Aided by the shortcomings and unpopular policies of the Galveston port, the Houston Direct Navigation Company quickly built up a thriving operation. This company also held the right to improve Buffalo Bayou, subject to supervision by the state engineer.[7]

Fresh impetus for improvement came with incorporation of the Buffalo Bayou Ship Channel Company in 1869. The city transferred to the new company the right to collect tonnage fees. Using these tolls, the corporation promised to open a 9-foot channel from Bolivar Roads to Main Street. A major project undertaken by this company was cutting a canal across Morgans Point to eliminate the problem of Clopper's Bar.[8]

Meanwhile, the city petitioned the national government to make Houston a port of entry. First presented in 1867, this request was granted on July 14, 1870. Barely a month earlier, on May 24, 1870, the state legislature had appealed to the United States to improve the bars along the Texas Coast.[9]

First Federal Survey

The rivers and harbors act of 1870 called for the first federal survey for a channel of navigation through Buffalo Bayou and Galveston Bay. Lt. H. M. Adams discharged this assignment between December 16, 1870 and January 6, 1871, with William D. Duke conducting the field work.

Opposite page: Photographic reduction of 1871 pen-and-ink drawing executed on linen, this portion of the original shows Buffalo Bayou from Main Street at left to a point beyond Sims Bayou at right.

Adams reported to Capt. C. W. Howell in New Orleans that he found the bayou at least 70 feet wide and navigable to Houston for vessels drawing less than 4 feet. He attributed the only obstruction to navigation to "the nature of the bayou itself between Harrisburgh [sic] and Houston." Besides being "narrow" and "circuitous," this stretch of the bayou was already experiencing growing pains from Houston's modest population of fifteen thousand inhabitants. This early urbanization, manifested in "clearing off and cultivation of the banks," accounted for shoaling where former depths of 15 or 20 feet had been reduced to but 3 or 4 feet by 1871.[10]

Below Harrisburg, Adams noted Clopper's Bar and Red Fish Bar as the only obstructions. The channels across these bars afforded barely 4 feet, in contrast to the average depth of 8½ feet through Galveston Bay.[11]

Citing Houston's prominence as the railroad center of the state, Lieutenant Adams considered the advantages of improving the channel "obvious." While cotton, hides, and tallow comprised the principal exports, a sizable portion of the freight "of a miscellaneous character" that traveled up the bayou contained iron and other materials for the railroads being pushed forward from Houston. Adams recommended a 6-by-100-foot channel, justified on the grounds that it would create competition for the single railroad line from Houston into Galveston, diminish the cost of goods sent into the interior, facilitate the export of produce, and aid in the progress of railroad expansion.[12]

To dredge this channel through the bars, Adams estimated costs of $10,560.50 for Red Fish Bar and $52,244.50 for Clopper's Bar. He indicated the results would last only temporarily. Improvement of the 8 miles between Harrisburg and Houston would amount to considerably more — $319,212 — and would involve not only snagging and dredging, but also preventing bank erosion by protecting the slopes with sheet piling.[13]

Transmitting Adams's report to the chief of engineers, Captain Howell questioned the propriety of making federal improvements on a channel from which a private company was collecting tolls. Adams had reported that the Buffalo Bayou Ship Channel Company was "making the revenue more secure" by cutting a canal at Morgans Point, through which deep-draft vessels would be obliged to pass in order to avoid Clopper's Bar. Howell advised that before the government begin any work on the channel, the company should relinquish its right to collect tolls on vessels proceeding up the bayou to Harrisburg and the government should reimburse the company for its expenditures on improvements below Harrisburg. Like so many of Howell's prophetic suggestions, this appears to have been disregarded at the time. On June 10, 1872, Congress appropriated $10,000 for improvement of Red Fish Bar.[14]

Morgan's Controversial Cut

Events within the next few years brought the matter of the Morgans Point canal sharply into focus. A financial panic in 1873 halted the work of the Buffalo Bayou Ship Channel Company. Fortuitously, the following year, the Galveston Wharf Company withdrew from Commodore Charles Morgan the free use of its facilities, a concession his shipping line had enjoyed since 1867. This mighty pioneer of Gulf Coast shipping had just finished moving his steamship line headquarters from New Orleans to Brashear City (renamed Morgan City) in Louisiana where, by May of 1872, he had dredged a seaway from the Atchafalaya River to the Gulf; in 1874, he had not only dredging experience, but also idle dredging equipment.[15]

With his privileges at Galveston terminated, Morgan cast his shrewd eye up to Buffalo Bayou where he saw opportunity in the railroad boom. Thus Morgan was receptive to an appeal by the hard-pressed Buffalo Bayou Ship Channel Company to take over its operation. On July 1, 1874, Morgan agreed to construct a channel 9 by 120 feet from Galveston Bay to Houston for $806,500 of the company's unissued capital stock and put his dredges to work under the supervision of Capt. John J. Atkinson. Having acquired control of the Buffalo Bayou company, Morgan also picked up controlling interest in the Houston Direct Navigation Company and the Texas Transportation Company, which provided in its charter for construction of a railroad from the vicinity of Brays Bayou to trunk line connections in Houston.[16]

While the army engineers were dredging a channel through Red Fish Bar and deepening the route across Galveston Bay, Morgan continued construction of the canal across Morgans Point and began developing terminal facilities at a spot where Sims Bayou joined Buffalo Bayou. The completed complex, including railroad, 1,100 feet of wharves, and a 250-foot-wide turning basin, was named Clinton after Morgan's birthplace in Connecticut. By April of 1876, Morgan's canal had been dug and the Morgan Line steamship, *Clinton*, drawing 9½ feet of water, navigated the new ship channel across the bay and up to Clinton, where goods could be loaded onto trains and continue the 6 miles up to Houston, center of the railroad network. The 6,100-foot channel dredged by the army engineers at that time was 14½ feet deep at mean low tide and connected respective depths of 9 feet and 8½ feet in the upper and lower bays. Already, most interests along the bayou were calling for a 12-foot channel that would eliminate the need for lightering in Bolivar Channel.[17]

After the opening of Morgan's canal and the *Clinton*'s arrival at Sims Bayou, traffic picked up and the channel bustled with ships of the Morgan

Line and business of the Houston Direct Navigation Company. Taking a greater interest in the channel, Congress asked the engineers to recommend a route across Galveston Bay; in the spring of 1877, J. A. Hayward surveyed the upper bay and H. C. Ripley, the lower. The board of engineers convened in September of that year favored the direct route from the head of Bolivar Channel to Red Fish Bar.[18] Subsequent appropriations were more generous and soon the engineers had contractors at work on a 12-by-100-foot channel.

Hayward did note in his report that vessels drawing more than 5 feet were obliged to travel through Morgan's canal, paying a fee of ten cents per ton. For deeper-draft vessels, Hayward did not know the rates, but he quoted the *Galveston Daily News* of February 16, 1877, which reported channel fees totaling $105.26 levied on the schooner *George Sealy* in October of the preceding year. Bay improvements made by the army engineers permitted navigation up to the private canal, beyond which Morgan's Buffalo Bayou Ship Channel Company collected tolls. This practice of charging for passage through the canal was clearly growing into a larger problem. Morgan not only held to his right, but went a step further and stretched a heavy chain across the canal to assure that no vessels slipped through without paying.[19]

After the commodore's death in 1878, the Morgan interests proposed turning over their improvements to the federal government. A provision in the rivers and harbors act of 1879 acknowledged congressional acceptance of the proposal. The actual transfer took place only after completion of the government channel up to Morgan's cut in 1889, evaluation of his improvements by a commission of army engineers late in 1890, and mounting indignation and appeals to Washington. The odious chain was finally removed on May 2, 1892, when the U.S. paid $92,316.85 for the 5½-mile-long canal.[20]

Morgan had viewed his operation at Clinton as a stopgap measure pending completion of his railroad between Houston and New Orleans. Adhering to this long-range policy, his heirs opened the railroad in 1880, thereby diverting traffic from the ship channel.[21] Maj. S. M. Mansfield took note of the departure of the Morgan traffic, reporting in 1883 that "conditions have very materially changed" since the 12-foot channel project was adopted in 1876. He correctly predicted that

> . . . completion of the railroad through from Houston to New Orleans and changes in the railroad system of Texas are about to result in the abandonment of Clinton as a transfer point.[22]

Among the other changed conditions that were to adversely affect immediate development of the ship channel were the gradually increasing depth over the bar at Galveston, nonuse of the cut that had been made through the lower bay, and lack of permanence from the dredging improvements that had been undertaken. All these were cited by Mansfield, accounting for his "not being able to bring myself to the point of *recommending an expenditure . . . in dredging* in this open bay."[23] Appropriations for the Galveston Bay Ship Channel were suspended from 1883 to 1888.

The Buffalo Bayou Project

At the other end of the line, the Houston Cotton Exchange took the lead in calling for improvements on the bayou. Congress responded on June 14, 1880, by ordering an examination of Buffalo Bayou from Sims Bayou at Clinton to the mouth of White Oak Bayou at Houston. Assistant Engineer R. B. Talfor conducted this examination, which resulted the following year in adoption of a project to clear and enlarge that portion of the bayou to channel dimensions of 12 by 100 feet. Overhanging oak, cottonwood, pine, and magnolia trees, roughly seven hundred to the mile, would have to be removed along 11 miles of the bayou. Talfor figured the necessary snagging, dredging, and sheet pile revetments where the banks tended to cave in would cost $385,299.50, or $66,000 more than Adams had estimated ten years earlier. This Buffalo Bayou project was separate and distinct from the Galveston Bay Ship Channel project. First funded in 1881 with $25,000, the Buffalo Bayou project received appropriations every two years from 1882 to 1896, amounting to $228,750 altogether. The project in Galveston Bay received a total of $849,016.85 from its adoption in 1872 until 1896.[24]

Maj. A. M. Miller, the officer heading the Galveston Engineer Office, reported in 1896 on the status of the Buffalo Bayou project. While the channel had been periodically cleared and deepened, the improvements failed to endure. Adding to chronic problems of surface wash from the banks and a fresh crop of snags and logs following each heavy rain, Houstonians were using the bayou as a dumping ground for the city's sewage, much to the detriment of both health and navigation. At the time of Miller's report, the channel had been recently cleared and deepened to 10 feet.[25]

Viewing Buffalo Bayou as "one link in a waterway designed to connect Houston with Galveston and the Gulf of Mexico," Major Miller pointed out the wisdom of coordinating the improvements on Buffalo Bayou with

those in Galveston Bay, rather than handling them under separate appropriations as had been the practice:

> In Buffalo Bayou the depth is generally less than that in Galveston Bay, consequently vessels that could otherwise reach Houston are prevented from going there.
>
> To remedy this it would seem to be more beneficial if both works were consolidated into one, so that whatever appropriations were made might be expended at such points in the entire distance to Houston as would enable a channel of a uniform width and depth to be maintained.[26]

Miller also recommended beginning the improved ship channel at the head of Long Reach, a point on the bayou about 6½ miles below Main Street, to "obviate the maintenance of a very narrow, tortuous, and shoal channel into the heart of Houston."[27]

Determination for Deep Water

The dramatic deepening of the bar at Galveston, from 14 feet in 1893 to 25 feet in 1897, jeopardized the future of the Houston port activity. If oceangoing vessels could cross the bar and unload their cargoes at the Galveston wharves, the Houston barge trade would be doomed to obsolescence. Consequently, farsighted Houstonians began a deep-water movement of their own in the late 1890s, calling for a 25-foot-deep channel.[28]

Congressional action on February 1, 1897 directed the secretary of war to make an examination and survey for a water channel of not less than 25 feet deep and 100 feet wide from the Galveston jetties up the existing ship channel and Buffalo Bayou to Houston, and for a harbor at or near Houston with minimum dimensions of 25 by 500 feet. For this purpose, a board of engineers, chaired by Col. Henry M. Robert and including Major Miller and Capt. George M. Derby, met at Houston on July 26, 1897. The survey had been made in April; on July 28, these three officers made a personal examination of the 58-mile route. To estimate the cost of the proposed improvement, they divided the channel into three segments, based on the difficulty of dredging and disposal involved in each. The first division, 25 miles through the open waters of Galveston Bay and Morgan's canal, could be easily dredged with no problems other than unfavorable weather for five cents per cubic yard. Recommending a width of 150 feet through this portion of the channel because of its tendency to deteriorate,

they figured the work could be done by hired labor and plant owned by the government for $1.1 million. This would necessitate construction of two suction dredges costing $100,000 each. In the lower bay, excavated material would be placed to the west of the channel so as not to interfere with the tidal basin. In the upper bay, the board recommended a dike be constructed east of the channel to contain the dredged material and protect the channel from the influx of sand and silt stirred up in heavy storms.[29]

The second division, 24 miles between the north end of the Morgan canal and Harrisburg, while presenting no dredging difficulties, would require towing and dumping of the dredged matter. At a cost of fifteen cents per cubic yard, this division could be improved to dimensions of 25 by 100 feet for an estimated $900,000.[30]

The third division, 9 miles between Harrisburg and Houston, would require "removal of at least one bend by a cutoff and straightening and widening of others." About 2¼ miles below White Oak Bayou and just below the San Antonio and Aransas Pass Bridge, the board selected a point which they advised removing so that the 500-foot-wide turning basin could be located there. Work on this portion, owing to the greater disposal problems and correspondingly higher per unit cost of twenty cents per cubic yard, came to $1.7 million. An additional $300,000 for administration and contingencies brought the total estimate for the future Houston Ship Channel to $4 million with an annual maintenance cost of $100,000. The board considered this improvement justified by the "conservative estimate" of $600,000 that would be saved in freight shipped through the Galveston entrance and along the proposed channel.[31]

Merged under the rivers and harbors act of 1899, the two projects became known as "Galveston Ship Channel and Buffalo Bayou, Tex." This act also accepted the report of the 1897 board of engineers and, as amended the following year, appropriated $300,000 to the consolidated project, specifying that sums previously appropriated and available for either of the earlier projects and not necessary for administration, surveys, and maintenance be applied to improving division one, from the Galveston jetties through Morgan's cut. As of July 1, 1900, the balances remaining were $36,210.52 from the Galveston Bay Ship Channel project and $18,599.86 from the Buffalo Bayou project. With the limited funds available, work was begun constructing a pile and brush dike from Morgan's cut to Red Fish Bar late in 1900 and dredging a channel 17½ by 80 feet through the bay early the next year.[32]

Capt. (later Col.) Charles S. Riché, the only officer to head the Galveston Engineer Office on three separate occasions, was then serving his second tour of duty in Galveston. Third highest graduate in the West Point class of 1886, Riché was first assigned to Galveston in September of

1897, shortly before the board of engineers reported on their examination for a 25-foot project. This sojourn was interrupted by the Spanish-American War. While he served with the First U.S. Volunteer Infantry in New Orleans, he was relieved in Galveston by the bewhiskered Col. James B. Quinn, who had served there under Howell in the 1870s. Riché returned to his duties with the Galveston Engineer Office in November, 1898 and remained there until May, 1903. During his final assignment in Galveston from 1912 to 1916, he would see the opening of the deep-water Houston Ship Channel. Reporting on this project in 1901, Riché noted that the excavation being performed by Charles Clarke & Co. of Galveston for 6.98 cents per cubic yard was being done at "one of the lowest contract prices ever obtained in the United States."[33]

A devastating hurricane swept across Galveston in 1900, decimating the island and killing thousands of people. One of the country's worst natural disasters, this dire event added fuel to the simmering flame of Houston's ambitions, giving weight to the city's arguments in favor of a more protected port. Congress provided somewhat more generously in 1902 by appropriating $1 million that could be applied to continuous work over the next few years. This permitted expanded operations, to dredge both divisions one and two to a uniform depth of 18½ feet and to widen the bay channel to 150 feet, begun under contract by the Bowers Southern Dredging Company of Galveston in 1903.[34]

Two men joined the Galveston Engineer Office about this time, both of whom would achieve prominence in the years ahead. Capt. (later Lt. Gen.) Edgar Jadwin, who became district engineer in May, 1903, was one of the most outstanding officers to grace the Galveston roster. Graduating with the highest honors in his West Point class of 1890, Jadwin went on to distinguish himself on many fronts throughout his thirty-nine-year army career. During the Spanish-American War, he served with the Third U.S. Volunteer Engineers in Cuba, for a time commanding a battalion of his regiment at Matanzas, where he brought about many sanitary reforms. After his four years of service at Galveston, he was selected to assist General Goethals in construction of the Panama Canal. His accomplishments there included a ship channel through Gatun Lake and a breakwater at the canal's Atlantic terminus. As commanding officer of the Fifteenth U.S. Engineers Regiment during World War I, Jadwin was responsible for extensive construction operations, earning the Distinguished Service Medal and decorations from both the British and French governments.[35]

On June 27, 1926, Jadwin was appointed chief of engineers. In this capacity, he sponsored the important Mississippi River flood-control plan which was adopted by Congress in March of 1929. His expertise and

The men who built the Houston Ship Channel, photographed at Morgans Point prior to 1915. Capt. Charles Crotty is seated at extreme left; C. M. Wood, third from left. Commodore E. M. Hartrick stands at extreme right. (Courtesy of Jack Beck)

astuteness were highly instrumental in securing passage of this controversial legislation. Jadwin retired from active service as a lieutenant general in August of 1929. The following year, President Hoover offered him the chairmanship of the newly created Federal Power Commission. He declined this appointment, serving instead as chairman of the Interoceanic Canal Board to determine whether the government should construct a canal across Nicaragua or increase the capacity of the Panama Canal. This assignment was cut short by his death in the Canal Zone on March 2, 1931.[36]

Charles Crotty became a civilian employee of the United States Army Corps of Engineers on April 29, 1904. A veteran of the Spanish-American War, Crotty had served as a private under Jadwin in Cuba. Presenting himself at the Galveston Engineer Office's headquarters in the Trust Building at Twenty-third and Postoffice streets, Crotty began a forty-year career largely devoted to the future Houston Ship Channel.[37]

His indoctrination was less than auspicious. Ushered into Captain Jadwin's office, he learned that the only position available was a temporary one as a surveyman with a field party that was completing a transit survey of Buffalo Bayou. He promptly accepted the two-month assignment, with compensation amounting to $50 a month and board. From Commodore E. M. Hartrick, the principal assistant engineer, he received his instructions.[38]

"Young man," said Hartrick, "you are going out to a malarial swamp where men do not last very long, but if you will get a quart bottle of good whiskey, put in it all the quinine it will absorb, and take a tablespoonful before each meal and two before going to bed, you will probably last the two months."[39]

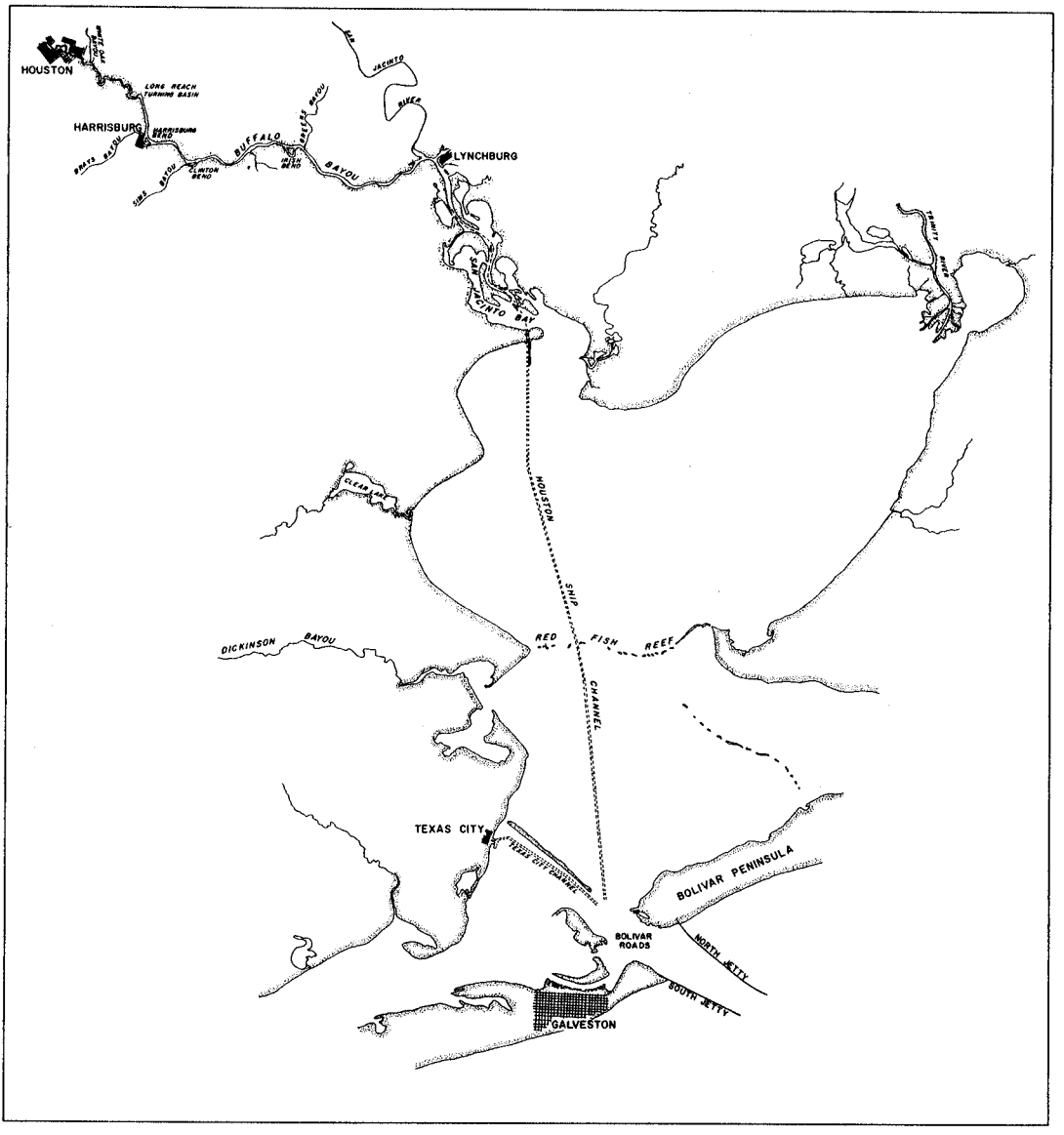
Crotty replied that he was a teetotaler and could not take the whiskey, adding that he had served in Cuba and the Philippines without suffering from malaria. Hartrick responded, "I don't care whether you take the whiskey or not, but take the quinine, or I'll not be responsible for your health."[40]

Although he disregarded Hartrick's emphatic advice and used neither the quinine nor the whiskey, Charles Crotty survived his temporary assignment and secured permanent employment with the Galveston District. In April, 1920, he resigned his position with the army engineers to become assistant director of the Port of Houston, a post he held until his retirement in 1944.[41]

Captain Jadwin addressed himself to a new problem that was becoming evident about the time he assumed charge in Galveston. Ships were growing larger and modern vessels were approaching lengths of 300 to 350 feet. Already, vessels of 220 to 246 feet were encountering difficulties in navigating the sharper bends in the bayou, being obliged to reduce their speed to 2 miles per hour, and even then occasionally running into the banks. In August of 1904, Jadwin proposed two cutoffs — at Clinton Bend, a little below Sims Bayou, and at Irish Bend, just above Greens Bayou. He further advised that other bends be eased to a working radius of 2,500 feet.[2]

A recurring and controversial theme in the history of Buffalo Bayou centered on the location to be considered the proper head of navigation. Once again, this troublesome issue resurfaced, now a matter of where to terminate the deep-water improvement. The five-man Board of Engineers for Rivers and Harbors was requested by the House Committee on Rivers and Harbors to tackle this problem and to consider the project modifications proposed by Jadwin.[43]

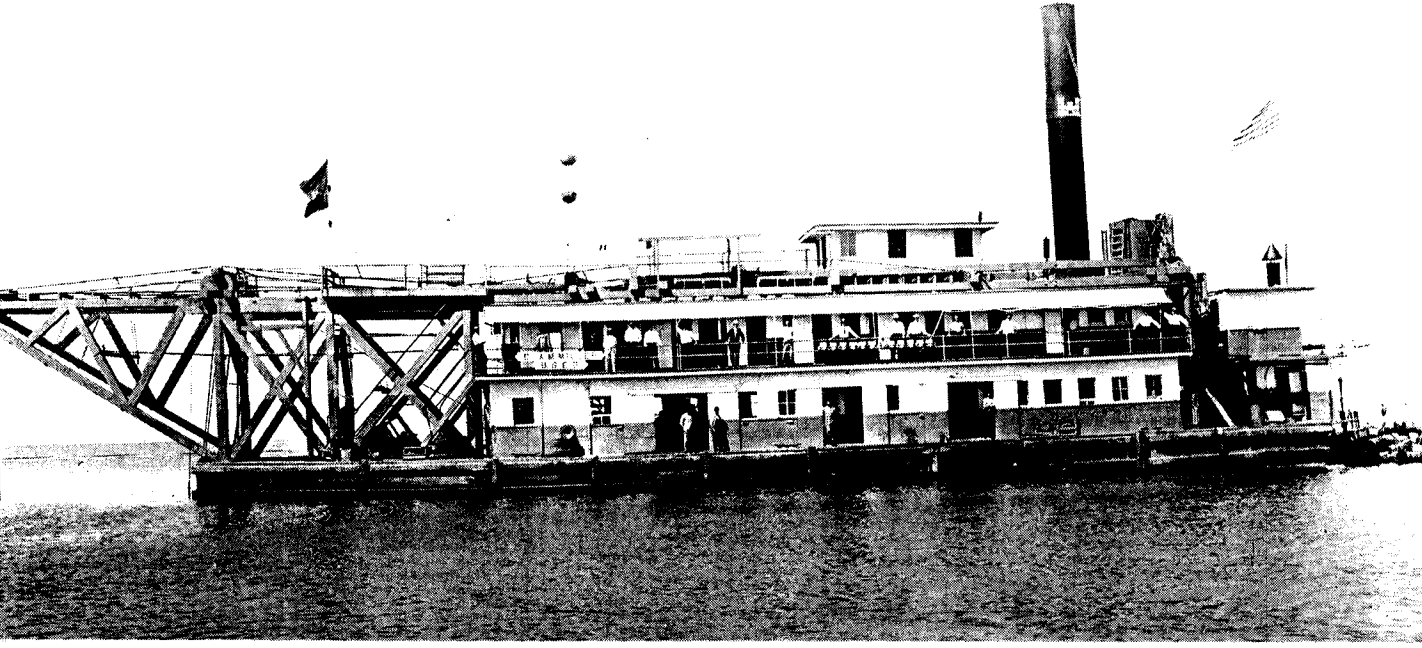
Although the question over the terminal point of the ship channel would persist up until, and occasionally beyond, 1926, when Houston extended its city limits to include Harrisburg, the board of engineers recommended in 1904 that the improvement be terminated and the turning basin be located at the head of Long Reach, 2 miles above Harrisburg. These officers modified dimensions of the turning basin to a 600-foot diameter and endorsed Jadwin's proposals for cutoffs at Irish Bend and Clinton Bend. They advised another cutoff at a point opposite Harrisburg, and easing of all other bends to a least radius of 2,500 feet. On March 3,



Houston Ship Channel, showing cutoffs at Harrisburg, Clinton, and Irish bends

1905, Congress appropriated $200,000 for "continuing improvement to a point at or near the head of Long Reach," as Jadwin and the board recommended.[44]

Under contracts awarded to Bowers Southern Dredging Company, work began on Irish Bend and Clinton Bend cutoffs. During 1906-07, the Harrisburg cutoff was made by two U.S. dredges, the *Gen. H. M. Robert,* a small pipeline dredge, and the *Col. A. M. Miller,* a new 20-inch pipeline dredge. Charles Crotty helped plan the turning basin at Long Reach, which was dredged under contract between 1906 and 1908. At this time, the project depth was still only 18½ feet, appropriations were



U.S. cutter pipeline dredge Col. A. M. Miller *was built in Galveston in 1906.*

clearly inadequate for major strides to be made, and the Houston city fathers were once again impatient with the lack of progress.[45]

Houston leaders joined Beaumont in securing legislation to provide for creation of navigation districts empowered to issue bonds. The bill passed by the Texas legislature in 1909 paved the way for not only Houston and Beaumont, but also for Orange, Corpus Christi, and other future Texas ports. Next, a Houston delegation met with the Rivers and Harbors Committee in December, 1909, setting a precedent by offering to share equally with the federal government the cost of a 25-foot channel. Armed with the favorable response of this committee, members of the delegation returned home to convince the Harris County electorate to support their plan. In January, 1911, the voters created the Harris County Houston Ship Channel Navigation District and passed a $1,250,000 bond issue.[46]

Houston Ship Channel

This renewed drive for deep water was reflected in the Rivers and Harbors Act of June 25, 1910, which changed the name of the project to the Houston Ship Channel and authorized $2.5 million, half of which would be furnished by the new navigation district. By 1912, financing was assured and work on the channel was ready to get underway, this time in earnest.[47]

Early in 1912, Charles Crotty was called into the office of the district engineer. Maj. Earl I. Brown asked him how long it would take to estimate and prepare specifications for dredging the Houston Ship Channel to 25 feet. Crotty estimated forty to forty-five days, thirty for making

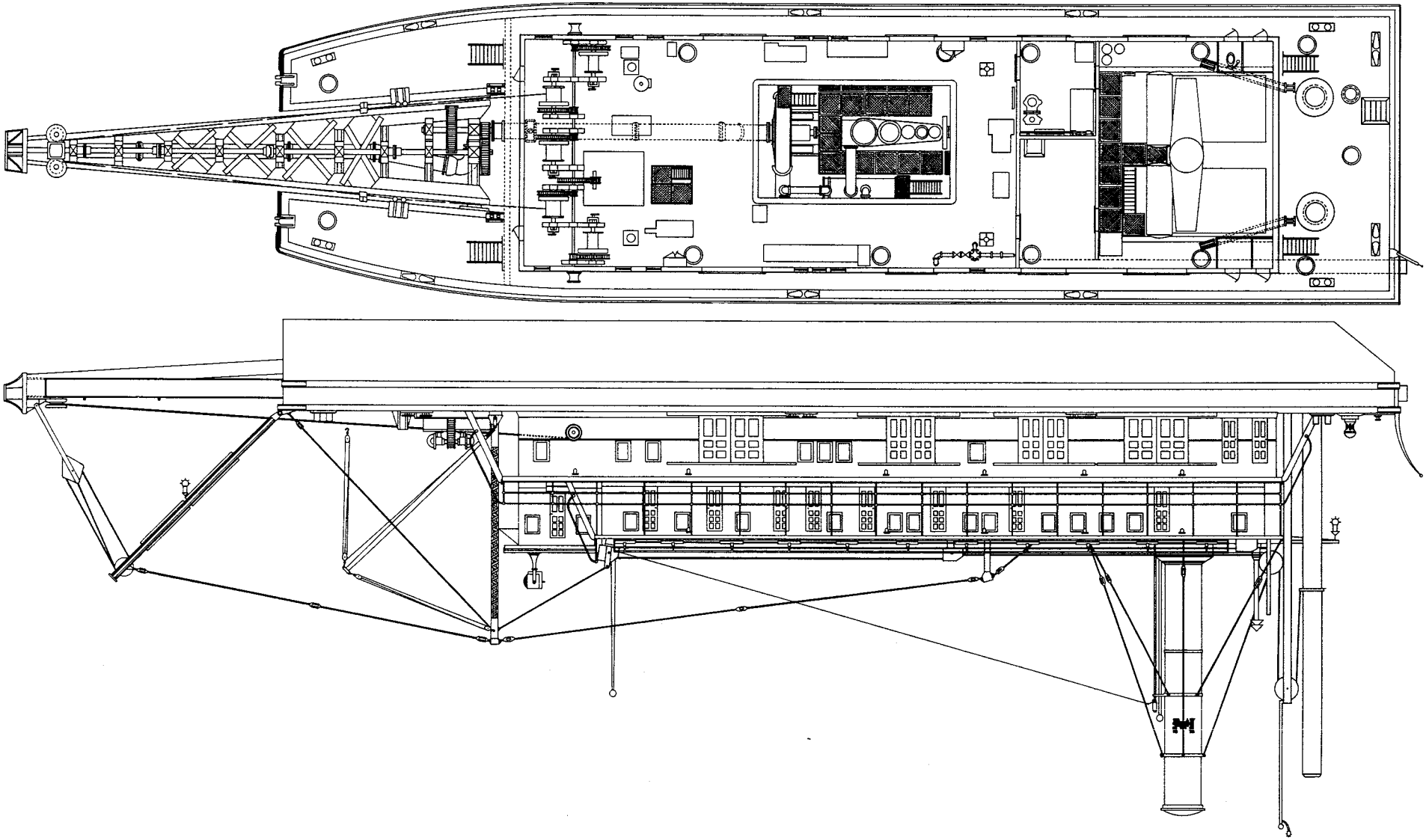
a survey and another ten to fifteen for writing specifications. Brown replied, "Use available data and have specifications on my desk in one week." Major Brown's orders were followed and the estimate made that week differed only 1,341 cubic yards from the total 23 million cubic yards actually dredged. A survey party organized in April under Crotty's supervision remained in the field until work under the contract, awarded in June to the Atlantic, Gulf & Pacific Dredging Company, was completed more than a year ahead of schedule on September 7, 1914.[48]

The first oceangoing vessel to use the new channel was the schooner *William C. May*, 184 feet long and drawing 16½ feet of water; she docked at the Southern Pacific wharves at Clinton on September 26. The second, the Bull Line steamer *Dorothy*, 290 feet long and drawing 19 feet, received an official welcome on October 12. On November 10, 1914, President Wilson pushed a pearl-topped button in Washington to set off cannon on the banks of the turning basin, marking the formal opening of the Houston Ship Channel.[49]

Houstonians soon learned that it would take more than a 25-foot channel to attract commercial vessels. Several major setbacks followed the opening of the ship channel. Captains of large vessels were reluctant to venture into an unknown channel, potential world war threatened to cut sharply into export trade, and public shipping facilities were lacking. To remedy this last deficiency, the voters went to the polls on October 28, 1914 and approved a $3 million bond issue for construction of wharves, warehouses, and terminal facilities.[50]

The Southern Steamship Company initiated regular coastwise service between Houston and New York (later moved to Philadelphia) in August of 1915. The 312-foot-long *Satilla*, drawing 22 feet, made the first run. For her arrival which was anticipated on August 19, a "monster celebration" was planned. Col. C. S. Riché was among the scheduled speakers. The event never came to pass, however, due to a severe storm that swept through the area. The *Satilla* rode out the ordeal in the Gulf, arriving at the turning basin on August 22.[51]

For the Galveston District, the losses caused by the raging hurricane were particularly tragic. The *San Jacinto* and the *Sam Houston*, two recently completed government hydraulic pipeline dredges which had been constructed for channel maintenance, sustained more than $72,000 worth of damage. The quarterboat that had been moored at Morgans Point also fared badly. It had furnished home and headquarters for Charles Crotty's survey party ever since the large-scale operations begun in 1912 had required continual survey activities. This "floating office" could be towed to different sections of the channel as the work progressed.[52]



The quarterboat

Commodore E. M. Hartrick, who had served with the Galveston Engineer Office since as early as 1888, was among those aboard the quarterboat when the storm moved in at Morgans Point. Semiretired and disabled by failing vision and frail health, Hartrick had functioned as a consultant to the survey party while the channel was being deepened. As the winds intensified and the waters rose nearly to the top of the creosoted pile wharf, the men were advised to leave the quarterboat. Hartrick refused, stating emphatically that he had ridden out many such storms and would "rather be afloat than ashore." Four other men remained with him until the high winds dashed the boat against the piling, breaking the hull. When the boat began to sink, the men donned life preservers and set out to swim the 50-foot distance to shore. Hartrick refused assistance saying it was "every man for himself." Although he almost reached the shore, the strong current and lethal debris proved too much for him and he perished in the attempt. C. M. Wood, who later became project engineer for the Houston Ship Channel, was swept along the embankment until he

Opposite page: Construction drawings of main deck and outboard profile for 20-inch hydraulic pipeline dredges San Jacinto *and* Sam Houston, *built in 1915 (Traced from original photostat)*

Harrisburg Field Office

managed to grasp a small bush to which he clung until the next morning when the water subsided. Another of the men was able to climb into an empty water tank where he spent the night. The other two men became tangled in the telephone wire between the quarterboat and the nearby field office building and were able to pull themselves to safety.[53]

The quarterboat was rebuilt after the 1915 storm and returned to Morgans Point; in 1923, it was relocated at Harrisburg and hooked up to the electricity line there. This boat served as the Harrisburg Field Office until a concrete office building replaced it in the early 1930s. The Harrisburg office was maintained until the mid-1950s, when the number of area offices was reduced and Houston Ship Channel operations were transferred to the Fort Point office on Galveston Island.

The outbreak of World War I created an urgent need for regular army officers to be reassigned to the war effort. For the Corps of Engineers, this meant shifting many district engineers overseas and leaving senior civilian engineers in charge. When Galveston's Col. E. N. Johnston was called into the field, Raphael Chart Smead, a Reserve Corps officer, was brought in to succeed him. From October 16, 1917 until January 24, 1919, "Major" Smead served as Galveston's only civilian district engineer.[54]

Departing from the West Point tradition of his father and grandfather, Smead had been educated mainly in the public schools. From 1878 until

1885, he worked as a surveyor and engineer for some of the railroad lines spreading across the country. He joined the army engineers in May, 1885. Attached to the office of the Washington Aqueduct in the District of Columbia, he superintended maintenance and operation of the aqueduct. In August, 1905 he was transferred to the new Dallas District, where he worked until his appointment to Galveston in 1917. After he was replaced by Col. Spencer Cosby at the end of the war, Smead served as principal assistant engineer in the Galveston District until November 28, 1919, when he succumbed to apoplexy in the course of his regular duties at the Trust Building.[55]

Industrial Influx

Before the end of the war, another generation of visionary Houstonians was once again projecting into the future; the Houston Ship Channel was about to turn a corner in its development. R. C. Smead appreciated the change that was imminent. Recognizing that Houston's identity as a distribution center would be modified by the industrial growth then gaining momentum, Smead wrote:

> The future of the Houston Ship Channel appears to lie in the direction of industrial development as its banks furnish very favorable locations for industries which would thus be given the advantage of water transportation. On account of the difficulty of widening the channel after these industries have located and built improvements, it seems advisable to now prepare a project for future development which can be adopted and adhered to in future.[56]

Already, in 1918, twenty-two industries had located along the channel below the turning basin and sixteen above it. Oil interests were quick to point out that the peculiar requirements of the petroleum-refining industry — "not only deep water, but abundant fresh water, large acreage, sufficient elevation to insure protection from floods and where the hazard of tropical storms is minimized" — could be met on the Texas Coast only along the Houston Ship Channel west of Morgans Point and along the Sabine and Neches rivers below Orange and Beaumont.[57]

The mechanics of transporting oil furnished additional incentive for channel improvement. As the importance of petroleum was growing, so too were the vessels that carried this vital commodity. By 1918, tankers with drafts of 25 to 30 feet were prevalent; but on the Houston Ship Channel, crude oil was being moved in oil barges 125 to 200 feet long, 30 to

38 feet wide, and with drafts varying from 6 to 14½ feet.[58] Unable to use the larger and more economical tankers on the channel, oil interests were clearly operating at a disadvantage. Consequently, they led the movement for deeper water.

Considering these developments, army engineers advised deepening the channel to 30 feet, widening it in the bay to 250 feet and in the river section to 150 feet, plus enlarging the turning basin and the stretch in front of the wharf at Manchester. Congress authorized these recommendations in 1919; by 1926, the channel had been dredged to accommodate the larger vessels.[59]

Dredging operations on Galveston Bay during the 1920s were not always routine. One crew brought up part of the cable that Commodore Morgan had stretched across his canal fifty years earlier. Other experiences bordered on the hilarious. One old-timer recalls a particularly turbulent occasion when the barge stationed alongside the dredge was unable to turn around because of the excessively strong current. Attempts to buck the tide were futile and the dumping crew, responsible for positioning of the barge, finally decided to let the wind do the job for them. The barge was secured to the dredge by lines running from either end of the vessel. The crew figured the man holding the line at the windward end of the barge would release his rope, and the barge, carried by the swift current, would swing around into the desired position. When everything was ready, the man directing the operation cupped his hands around his mouth and shouted, "Let 'er go, Charlie!" She went — so far and so fast, it took two weeks to find her. Their leader had overlooked one small detail: both of the men manning the lines were named "Charlie."[60]

In the middle of this decade, a young lieutenant was assigned to the Galveston District. Twenty years later, he would profoundly affect the course of world history. While attached to Galveston, Leslie R. Groves served a tour of duty on the Harrisburg quarterboat, for a duration considered "too long" by the other men aboard the vessel. This man, who in 1942 was pegged to direct the development of an atomic bomb, was unsurpassed at getting the job done, but he lacked those qualities that would have endeared him to his fellow workers. One day he was out with a crew working in the bay when the weather became very rough. The captain of the vessel decided it would be wise to return to shore, but Groves disagreed and ordered him to keep on going. As the weather continued to worsen, the captain asserted that as long as they were afloat he was in command and that once they were safely ashore, Groves might exercise his authority. Whether Groves was more influenced by this line of reasoning or by the crew member who stood ready to throw him overboard remains questionable, but he did acquiesce.[61]

Lt. Gen. Leslie R. Groves
(U.S. Army Photograph)

Above the Long Reach turning basin, the 6½-mile stretch of channel up to the foot of Main Street was used for light-draft navigation. Under provisions of the rivers and harbors act of 1907, this channel was dredged and snagged to dimensions of 8 by 40 feet in 1908. Redredged by the city of Houston in 1914, it supported considerable local traffic between the municipal wharves at Houston and the neighboring towns down the waterway. In 1918, 529,000 tons, consisting of sand, lumber, hardware, groceries, grain, cotton, oil and oil products, and shell, were moved along this channel. Several years later, it had deteriorated to a depth of 5 feet and, in 1925, Congress authorized enlargement to dimensions of 10 by 60 feet. Improvements since that time have mainly involved easing of bends and making one major cutoff at Turkey Bend.[62]

Throughout the 1920s, Houston aggressively pursued port expansion with a continuous building program and promotional activities. The results were apparent by 1930. Houston had surpassed her old rival, Galveston, ranking first in the nation for cotton exports. Oil and grain also comprised significant portions of the commerce that traveled along the channel. Houston placed third among U.S. ports for foreign exports.[63]

From then on, the story of the Houston Ship Channel becomes one of continuing enlargement. The channel's articulation with the Gulf Intracoastal Waterway augmented the steadily growing volume of traffic and, in 1932, army engineers recommended deepening to 32 feet. Within another three years, the board of engineers recommended and Congress

authorized a project providing for 34-foot depth plus further widening and easing of bends.[64]

World War II once again interrupted shipping operations and new appropriations, but it brought to the Houston Ship Channel a spurt of industrial development, most notably the petrochemical industry which grew out of wartime production of synthetic rubber. Irish Bend Island was made into a shipyard which turned out Liberty Ships at a staggering rate and other industries joined in the defense effort. At the end of the war, many installations along the bayou that had been operating for the government were converted to private enterprises. From 1946 to 1950, Col. Wilson G. Saville, a former Galveston district engineer, served as chairman of the navigation district board. In 1948, Houston ranked second in tonnage among U.S. ports and Congress authorized a 36-foot-deep project.[65]

To offset rising competition, enormous expansion and modernization of port facilities were undertaken in 1957, followed the next year by adoption of a 40-foot project depth. In Galveston Bay, a shallow-draft, 5-mile cut eastward, 8 by 125 feet, was completed in 1960, eliminating 9 miles of travel distance for barges operating between the ship channel and Trinity Bay.[66]

At present, Houston ranks third among the nation's ports in tonnage handled. More than 89 million tons passed through the Houston Ship Channel in 1974, accounting for almost one-third of the total tonnage moved through Texas ports. A successful example of federal and local cooperation, Buffalo Bayou has been transformed from a meandering stream into a vast industrial complex. Through their role in this waterway's development, Galveston army engineers have shared in the spectacular expansion of the "way station" at the junction of Buffalo Bayou and White Oak Bayou, from a settlement of barely forty-five thousand inhabitants at the turn of the century to three hundred eighty-five thousand in 1940, and to well over a million as the sixth largest city in the country by 1970.[67]

Notes to Chapter 4

[1] *Annual Report of the Chief of Engineers, United States Army, 1912* (Washington, D.C.: Government Printing Office, 1912), p. 692 (hereafter cited as *ARCE*, followed by date of fiscal year covered in report).

[2] Marilyn McAdams Sibley, *The Port of Houston* (Austin and London: University of Texas Press, 1968), pp. 48-53.

[3] *Ibid.*, pp. 68-70.

[4] *Ibid.*, p. 68.

[5] *Ibid.*, pp. 74-76.

[6] *Ibid.*, pp. 79, 83-85.

[7] *Ibid.*, pp. 87-88.

[8] *Ibid.*, pp. 92-93.

[9] *Ibid.*, p. 94.

[10] Rivers and Harbors Act of July 11, 1870, ch. 240, 16 Stat. 223; *ARCE, 1871*, pp. 533-36.

[11] *Ibid.*, p. 535.

[12] *Ibid.*, pp. 535-36.

[13] *Ibid.*, p. 536.

[14] *Ibid.*, pp. 535-36, 533; Rivers and Harbors Act of June 10, 1872, ch. 416, 17 Stat. 370.

[15] Sibley, *Port of Houston*, pp. 97-99.

[16] *Ibid.*, pp. 99-100.

[17] *Ibid.*, pp. 100-101; *ARCE, 1876*, pp. 587, 76-77.

[18] *ARCE, 1877*, p. 467.

[19] *Ibid.*, p. 461; Sibley, *Port of Houston*, p. 108.

[20] Sibley, *Port of Houston*, p. 105; *ARCE, 1879*, pp. 213-14; Rivers and Harbors Act of March 3, 1879, ch. 181, 20 Stat. 363; Sibley, *Port of Houston*, pp. 109-10.

[21] Sibley, *Port of Houston*, pp. 105, 108. During the 1880s, the extensive interests of the vast Morgan empire were consolidated into Collis P. Huntington's Southern Pacific Company.

[22] *ARCE, 1883*, p. 1080.

[23] *Ibid.*, p. 1078.

[24] *ARCE, 1881*, pp. 1342-47; *ARCE, 1901*, pp. 1934-35.

[25] *ARCE, 1896*, p. 1548.

[26] *Ibid.*

[27] *Ibid.*, pp. 1548-49.

[28] Sibley, *Port of Houston*, p. 114.

[29] H.R. Doc. 99, 55th Cong., 2d sess. (1897), pp. 1-4.

[30] *Ibid.*, p. 4.

[31] *Ibid.*, pp. 4-5.

[32] Rivers and Harbors Act of March 3, 1899, ch. 425, 30 Stat. 1121; Act of February 20, 1900, ch. 23, 31 Stat. 31; *ARCE, 1900*, p. 387; *ARCE, 1901*, p. 1933.

[33] U.S. Military Academy Association of Graduates, *Annual Report*, June 1926, pp. 169-71; *ARCE, 1901*, p. 1933.

[34] Rivers and Harbors Act of June 13, 1902, ch. 1079, 32 Stat. 331; *ARCE, 1904*, p. 371.

[35] U.S. Military Academy Association of Graduates, *Annual Report*, June 1931, pp. 273-74.

[36] *Ibid.*, pp. 273, 275.

[37] Charles Crotty, "Houston Ship Channel, Texas. Construction and Development" (Rough draft, 1946), p. 1, Galveston District Installation Historical Files.

[38] *Ibid.*

[39] *Ibid.*

[40] *Ibid.*, pp. 1-2.

[41] Sibley, *Port of Houston*, pp. 126-27.

[42] H.R. Comm. Doc. 35, 61st Cong., 2d sess. (1904), p. 2.

[43] *Ibid.*, p. 1.

[44] *Ibid.*, p. 4; Rivers and Harbors Act of March 3, 1905, ch. 1482, 33 Stat. 1117.

[45] Crotty, "Houston Ship Channel," pp. 4-7.

[46] Sibley, *Port of Houston*, pp. 133-37.

[47] *ARCE, 1912*, pp. 696-98, 2002.

[48] Crotty, "Houston Ship Channel," pp. 9-10; *ARCE, 1912*, pp. 2002-03.

[49] Sibley, *Port of Houston*, pp. 144, 146-147.

[50] *ARCE, 1915*, p. 875.

[51] Sibley, *Port of Houston*, pp. 149-50.

[52] *ARCE, 1916*, p. 934; Crotty, "Houston Ship Channel," p. 7.

[53] Crotty, "Houston Ship Channel," p. 15.

[54] *Galveston Daily News*, 17 October 1917; "Memoir of Raphael Chart Smead," *Transactions of the American Society of Civil Engineers* 83 (1921): 2335.

[55] "Memoir of Raphael Chart Smead," *Transactions of the American Society of Civil Engineers* 83 (1921): 2335; *Galveston Daily News*, 30 November 1919.

[56] H.R. Doc. 1632, 65th Cong., 3d sess. (1918), p. 10.

[57] *Ibid.*, pp. 4, 26.

[58] *Ibid.*, pp. 5, 24.

[59] *Ibid.*, p. 3; Rivers and Harbors Act of March 2, 1919, ch. 95, 40 Stat. 1275; *ARCE, 1926*, p. 907.

[60] Interview with W. E. Vandegaer, June 1974.

[61] Telephone interview with Jack Beck, October 1974.

[62] Rivers and Harbors Act of March 2, 1907, ch. 2509, 34 Stat. 1073; *ARCE, 1908*, p. 1518; H.R. Doc. 93, 67th Cong., 1st sess. (1921), p. 12; Rivers and Harbors Act of March 3, 1925, ch. 467, 43 Stat. 1186.

[63] Sibley, *Port of Houston*, pp. 159-60.

[64] H.R. Comm. Doc. 28, 72d Cong., 1st sess. (1932), p. 3; H.R. Comm. Doc. 58, 74th Cong., 1st sess. (1935), p. 3; Rivers and Harbors Act of August 30, 1935, ch. 831, 49 Stat. 1028.

[65] Sibley, *Port of Houston*, pp. 193, 195; H.R. Doc. 561, 80th Cong., 2d sess. (1948), p. 2.

[66] H.R. Doc. 350, 85th Cong., 2d sess. (1958), pp. 7, 44.

[67] *The World Almanac & Book of Facts 1976* (New York: Newspaper Enterprise Association, 1975), pp. 115, 210; U.S. Bureau of the Census, *Statistical Abstract of the United States 1975*, 96th ed. (Washington, D.C.: 1975), p. 24.